FREE REVISION PACK

Charged Particles in Magnetic Fields

Pearson Edexcel International Advanced Level Physics · Unit 4 (WPH14) · Specification points 106, 115

Easy | Hard | Multiple choice · past-paper questions

5	5	≈ 10 min
QUESTIONS	TOTAL MARKS	SUGGESTED TIME*

Contents

Q	LEVEL	FOCUS	SOURCE	MARKS
1	Easy	Speed of a proton from the magnetic force	Edexcel IAL January 2024 · Unit 4 · Q3	1 mark
2	Easy	Why a proton's circular path gets smaller	Edexcel IAL June 2024 · Unit 4 · Q9	1 mark
3	Easy	Comparing two particles from their paths	Edexcel IAL October 2023 · Unit 4 · Q7	1 mark
4	Easy	Identifying a particle from its spiral track	Edexcel IAL January 2023 · Unit 4 · Q4	1 mark
5	Hard	Electron moving at an angle to a magnetic field	Edexcel IAL October 2024 · Unit 4 · Q5	1 mark

Key ideas to have ready

- $F = Bqv \sin\theta$, perpendicular to the velocity: the particle moves in a circle.
- Radius $r = p/(Bq) = mv/(Bq)$: slower or lighter particles curve more tightly.
- Electrons: conventional current is opposite to their motion (reverse the rule).
- A spiral track shows a particle losing energy.

How to use this pack

1. The questions are grouped into levels (Easy and Hard). Work through them in order, and check your answers at the end of each level before moving on.
2. Every question is multiple choice with one correct answer. Write down your working anyway; that is how you find mistakes.
3. The separate mark scheme uses the same numbers and explains every answer.

Levels are based on how students did in Pearson's examiner reports where that information exists, plus our own difficulty rating. *About 1.5 minutes per question.

Questions are reproduced from Pearson Edexcel International Advanced Level past papers; Pearson Edexcel material is © Pearson Education Ltd. Question numbers have been changed to suit this pack. Get Better At Physics is an independent tutor and is not affiliated with or endorsed by Pearson. Free for personal revision and classroom use.

Easy

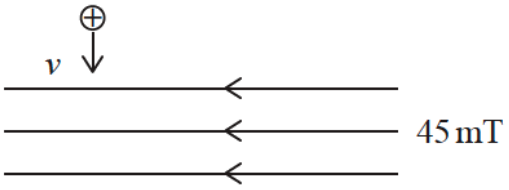
Definitions and one-step ideas. Most students get these right.

Questions 1–4

Choose **one** answer for each question and put a cross in the box next to it.

Edexcel IAL January 2024 · Unit 4 · Q3

1 A proton travelling at speed v enters a uniform magnetic field. The magnetic flux density of the field is 45 mT, as shown.



A force of 1.35×10^{-13} N is exerted on the proton.

Which of the following expressions gives v in m s^{-1}?

☒ **A** $\dfrac{1.35 \times 10^{-13}}{45 \times 1.6 \times 10^{-19}}$

☒ **B** $\dfrac{1.35 \times 10^{-13}}{45 \times 1.66 \times 10^{-27}}$

☒ **C** $\dfrac{1.35 \times 10^{-13}}{45 \times 10^{-3} \times 1.6 \times 10^{-19}}$

☒ **D** $\dfrac{1.35 \times 10^{-13}}{45 \times 10^{-3} \times 1.66 \times 10^{-19}}$

Edexcel IAL June 2024 · Unit 4 · Q9

2 A proton moving in a straight line with a speed v enters a magnetic field. The magnetic field is perpendicular to the direction of motion of the proton.

The proton follows a circular path of radius r in the magnetic field.

The path of the proton then decreases in radius.

Which of the following is a reason why the radius decreases?

☒ **A** The kinetic energy of the particle decreases.

☒ **B** The magnetic flux density decreases.

☒ **C** The mass of the proton increases.

☒ **D** The momentum of the proton increases.

Edexcel IAL October 2023 · Unit 4 · Q7

3 The diagram shows the paths of two charged particles, X and Y, moving at the same speed in a uniform magnetic field.



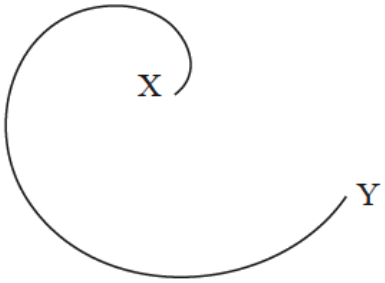
Which row of the table describes the properties of Y compared with the properties of X?

	Mass of Y	Charge of Y
☒ **A**	greater than	the same as
☒ **B**	less than	greater than
☒ **C**	the same as	less than
☒ **D**	greater than	less than

Edexcel IAL January 2023 · Unit 4 · Q4

4 The diagram shows the track of a charged particle in a magnetic field.

The magnetic field is directed into the page.



Which of the following particles could create this track?

☒ **A** a muon travelling from X to Y

☒ **B** a positron travelling from Y to X

☒ **C** a π^+ travelling from X to Y

☒ **D** an electron travelling from Y to X

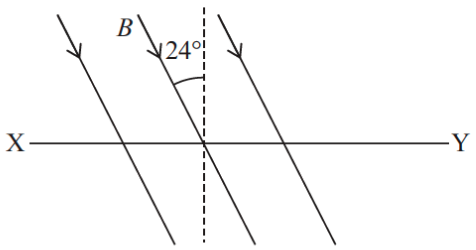
Hard Several steps, often with a trap built in. Fewer than 3 in 10 students get these right. **Question 5**

Edexcel IAL October 2024 · Unit 4 · Q5

5 An electron is travelling horizontally at velocity v through a uniform magnetic field of magnetic flux density B.

The magnetic field is at an angle of 24° to the vertical, as shown.

Not to scale



There is a force F acting on the electron due to the magnetic field. The force F is acting into the page.

Which row of the table gives the magnitude and direction of v?

	Magnitude of v	Direction of v
☒ **A**	$\frac{F}{B \times e \times \sin 24°}$	from X to Y
☒ **B**	$\frac{F}{B \times e \times \sin 24°}$	from Y to X
☒ **C**	$\frac{F}{B \times e \times \sin 66°}$	from X to Y
☒ **D**	$\frac{F}{B \times e \times \sin 66°}$	from Y to X

End of questions. Check your answers with the matching mark scheme. More free packs and 1-to-1 tuition:
www.getbetteratphysics.co.uk